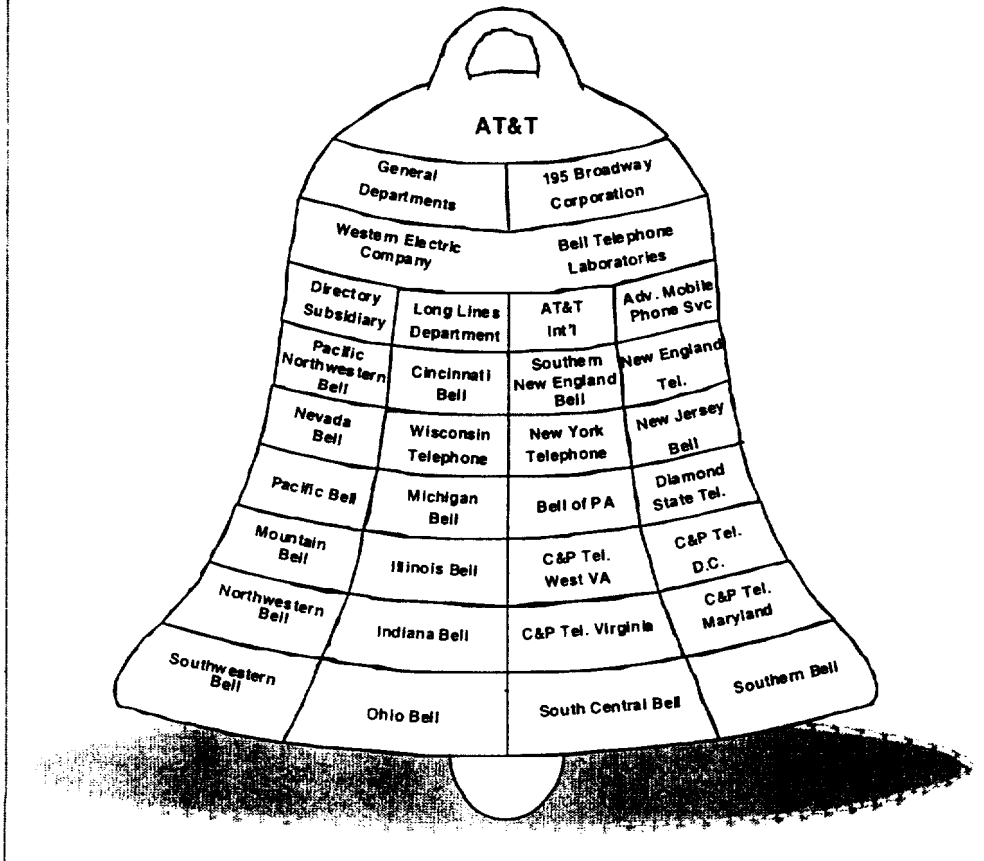
Simply put, regulation is the basis by which nearly all competitors offer broadband access. Over the past 16 years, several landmark laws and court rulings have spurred the development of competition, initially in the long-distance market and more recently in the local market. Although current trends point to a generally favorable environment for competitive providers, the regulatory climate is always fraught with some degree of contention and is therefore worthy of investor scrutiny. In this section, we describe the key role that regulation plays in the development of competitive broadband services.

◆ The 1984 AT&T Divestiture

Evolution of the Current Structure

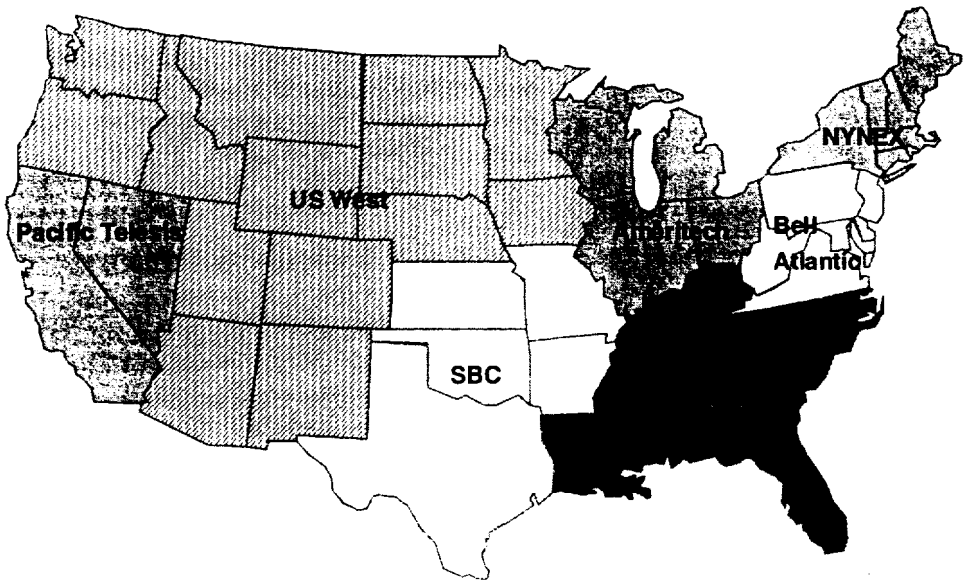
The genesis of today's local market structure was created in the wake of a 1984 federal court ruling, the Modified Final Judgement (MFJ), which mandated the separation of AT&T's local operations from its long-distance operations. The local operations were divided into seven Regional Bell Operating Companies (RBOCs), each serving a separate, contiguous set of states, and each prohibited from providing long-distance services.

Exhibit 3-1 ◆ Pre-Divestiture: One Monopoly



Source: San Francisco Consulting Group

Exhibit 3-2 ◆ Post-Divestiture: Several Local Monopolies



Note: Mergers have since taken place between Bell Atlantic/NYNEX and SBC/Pacific Telesis/Ameritech.

Source: FCC

During the twelve years between the MFJ and the Telecommunications Act of 1996, the telecommunications industry changed significantly. In the long-distance market, MCI, Sprint, and a host of other long-distance carriers built networks and took approximately 50% of AT&T's market share. In the local market, several firms, known as competitive access providers (CAPs), attempted to replicate the success of the early long-distance competitors by building new local networks. While no federal laws authorized this local competition, these competitors took their case to the state governments. By the time the 1996 Telecommunications Act was enacted, some 30 states had already authorized some form of local competition.

◆ The Telecommunications Act of 1996

The Telecommunications Act of 1996 was the first major piece of telecommunications legislation to be enacted since 1934. While the Act resulted in numerous federal laws aimed at opening the local market to competition, implementation of specific rules were left to the FCC and state commissions. Nearly every order issued by the FCC after the passing of the Act was contested in the courts, leading in most cases to significant delay in the deployment of competitive services. Only during the last 15 months, which have seen Supreme Court rulings and a spate of final FCC decisions regarding various elements of the Act, has a relatively stable set of rules for local competition emerged. A brief review of the major points of the Act is outlined in **Exhibit 3-3**.

Exhibit 3-3 ◆ Basic Principles of the 1996 Telecommunications Act

Description	
Interconnection	Enables competitors to connect their networks to that of the incumbent, thereby allowing multiple providers to access the public-switched telephone network.	The FCC sets standards for interconnection rates and conditions. Individual agreements are negotiated at the state level between carriers. Competitors may generally "opt in" to agreements previously established between any competitor and the incumbent.
Number portability	Enables customers who switch from one carrier to another to keep the same phone number.	The FCC has issued a set of standards and requirements. In some cases, number portability is not an option due to technical incompatibility among networks.
Access charge reform	Revisits the prices that long distance carriers must pay to connect their traffic with the local carriers. Access charges include implicit and explicit payments related to universal service.	Several carrier-sponsored proposals are being considered that would simplify the current structure.

Source: FCC and Dain Rauscher Wessels

◆ Regulation of Local Competition

Near the top of most competitors' regulatory agendas are items concerning access to incumbent local loops, central office collocation space, and operations support systems; followed closely by clear terms with respect to inter-carrier access payments. Following are more detailed descriptions of some of the key regulatory issues affecting local competition.

Interconnection is the basis by which all competitors enter the local market.

Interconnection: Interconnection is critical to competition since without it, users of competitive networks would not be able to communicate with users of the incumbent or other networks. Under the 1996 act, LECs are required to offer interconnection at "just and reasonable rates" and on the same terms they offer to any other carrier. In 1999, the Supreme Court and the FCC firmly established the ability of competitors to opt in to specific provisions of other carriers' agreements when creating their own interconnections with incumbents. Despite requirements that ILECs offer interconnections to competitors, the process of establishing one can take several months and typically requires the involvement of state authorities and even arbitration courts. Thus, interconnection plays a key role in determining time to market for a new business or an existing business looking to expand its footprint.

OSS coordination is important for delivering reliable service.

Operations Support Systems (OSS): Speedy and reliable access to incumbents' OSS is crucial to the ability of companies to pass data to one another concerning network operations; billing; service installations, changes, and additions; and other aspects of daily operations. OSS coordination plays a particularly important role when customers switch their service providers, since unless customers can change local carriers as quickly and efficiently as they can switch long-distance carriers today, meaningful local competition is significantly hampered. Inadequate OSS result in lost orders, delayed service, inaccurate billing, dropped telephone directory listings, and even loss of telephone service. OSS are also important in facilitating *number portability*, which allows a customer to switch local carriers while keeping the same phone number.

Inter-Carrier Payments: Inter-carrier access charges are the payments made from one carrier to another for connecting traffic between networks. Inter-carrier compensation schemes, which are occasionally tweaked by lawmakers and regulators, contribute to investor uncertainty because changes in them are heavily influenced by political factors, which places a layer of uncertainty on the affected revenue streams. Nevertheless, such mechanisms are deeply ingrained in the current system, so it pays for investors to examine carrier exposure to these charges as well as which charges are subject to change. The following two types of charges are particularly significant:

1. **Long-Distance Access Charges:** Long-distance providers generally pay two types of fees to local carriers for originating and terminating traffic—the PICC (pre-subscribed inter-exchange carrier charge), which is a flat-rate access charge; and the SLC (subscriber line charge), usually a per-minute fee. Under a recently adopted proposal, these two charges are slated to merge into a single line item on subscribers' phone bills.

2. **Reciprocal Compensation:** Under the Telecom Act, interconnecting LECs must establish reciprocal compensation with one another. This means incumbents must pay competitors when calls are terminated on the competitors' networks, just as competitors must pay ILECs when calls terminate on the incumbent network. In 1998, this issue gained visibility with investors, as many firms reported revenue shortfalls related to their difficulty in receiving ILEC reciprocal compensation payments. At issue were ILEC claims that calls placed to Internet service providers (which frequently use modem banks and phone

numbers belonging to competitive providers) are not local in nature and therefore should not be subject to local interconnection fees. Since that time, the issue has subsided somewhat in importance, as many of the ILEC disputes have been resolved. Further, many newer interconnection agreements directly address reciprocal compensation and thereby remove many of the uncertainties surrounding this revenue stream.

Collocation: Collocation, which refers to the physical point at which one network is connected with another, is an important factor in the business plans of competitors that wish to deploy their own facilities. When space is available in the ILEC central office (CO), incumbents are required to allow competitors to place their equipment in the CO in exchange for a cost-based rent. Traditionally, competitors have been required to pay for the construction of a caged area within the CO for their equipment. However, a 1999 FCC ruling that ILECs cannot require caged collocation has made it easier for competitors to gain access to COs by lowering the capital requirements of collocation. Although an appeals court recently questioned certain parts of the FCC collocation ruling, the Commission will continue to enforce its regulations during this reexamination and appears to be moving toward retaining the existing rules.

Resale: Under the Act, incumbent carriers must establish wholesale rates for their services to promote resale by competitors. Resale allows competitors to provide services to customers in areas not directly served by owned facilities and is important because carriers often use it as a transitional strategy to gain customers prior to investing in network infrastructure. Some carriers choose to use resale as a stand-alone strategy, devoting their focus exclusively to marketing and customer service. The range for wholesale discounts set by the FCC is typically 17%-25% of the retail rate.

Access to unbundled network elements gives competitors an option for entering the market with less up-front capital.

Unbundled Network Elements: Access to unbundled network elements (UNEs) allows competitors to use individual portions of the ILEC network in exchange for a fee roughly equal to the cost of operating those elements. Incumbents are required to provide access to a minimum set of network elements on a non-discriminatory basis at just and reasonable rates. The major categories of network elements include loops, network interface devices, local switching facilities, transport between central offices, signaling and call-related databases, and operations support systems. Access to UNEs is the basis by which both "smart build" competitors and DSL-based CLECs provide services. In addition to using individual UNEs, competitors may also use UNE combinations to deploy networks. Two UNE combinations that are growing in popularity and whose use was approved in a November 1999 FCC ruling are the *UNE-P* (UNE platform) and the *EEL* (enhanced extended link).

UNE-P: The UNE-P principle allows carriers to lease multiple UNEs and combine them into a full-service platform. This eliminates the need to deploy either a local switch or last-mile infrastructure and significantly reduces the need for competitors to establish local collocations.

EEL: EELs are combinations of last-mile loops and leased transport between the terminating ILEC central office and the nearest point of presence of the competitive provider. By using EELs, competitive providers can limit their use of collocation by relying on ILEC facilities to port traffic to a central node.

◆ RBOC Entry into the Long-Distance Market

To provide long-distance services to customers within their operating regions, RBOCs are required to meet the following 14-point checklist, contained in the oft-cited section 271 of the Telecommunications Act. Although the Act allows RBOCs to immediately provide interLATA (long distance) services in regions outside of their operating territory, but with limited market presence out of region, few RBOCs have been active on this front.

1. Provide interconnection at a reasonable rate.
2. Provide access to unbundled network elements at reasonable rates.
3. Provide access to poles, ducts, and rights of way.
4. Provide unbundled transmission from RBOC central office to customer premise.
5. Provide local transport from trunk site of switches.
6. Provide unbundled local switching.
7. Provide access to emergency, directory, and other operator services.
8. Offer directory listings to competitors' customers.
9. Offer access to telephone numbers.
10. Provide access to databases for call routing.
11. Offer number portability.
12. Offer local dialing parity.
13. Offer mutual compensation arrangements.
14. Offer service for resale.

In December 1999, Bell Atlantic in New York became the first RBOC to win state and federal approval for in-region long-distance services. Upcoming decisions regarding RBOC long-distance approval are expected in Texas (SBC Communications) as well as Pennsylvania, New Jersey, and Massachusetts (all Bell Atlantic). In each case, many issues remain to be clarified, particularly relating to in-region competition and competitive access to operations support systems. The lifting of RBOC long-distance restrictions will continue on a state-by-state basis, as the state utility commissions must approve all applications.

RBOC entry to the long-distance market could change the face of competition.

RBOC entry into the long-distance market could gradually have a significant effect on competition, since these carriers will be able to offer an expanded service bundle to their customers. Since approximately 60% of all toll calls originate and terminate in any given RBOC region, RBOCs would have an attractive opportunity to provide full, end-to-end services to many of their customers. This factor, coupled with the synergies that come with larger service footprints, is a primary motivation in the numerous RBOC consolidations over the last few years.

In-Region Competition and OSS Compatibility: Many RBOC long-distance applications to date have been dismissed because state regulators have not found enough quantifiable evidence of local competition. In addition, OSS compatibility has come to be considered an important part in determining whether an RBOC can accommodate competition and be allowed to offer in-region long-distance services. The issues of OSS and electronic bonding to the ILEC have recently come to the fore in light of difficulties that competitors encountered in early 2000 in New York with Bell Atlantic's back-office systems for switching customers over to their networks. These difficulties were traced to software glitches and faulty procedures for order acknowledgement, confirmation, and completion. This led to punitive

payments to the U.S. Treasury as well as service credits to competitors. We believe the New York experience will serve as somewhat of a measuring stick on such items as OSS compatibility, number portability, and e-bonding scalability in the long-distance approval process in other states. In the US WEST region, 13 states have begun a joint effort to establish compatibility of that carrier's OSS with competitors' networks, with similar efforts under way in other states within the regions of BellSouth and SBC as well as other states in Bell Atlantic's territory.

◆ RBOC Data Relief

Under the Telecom Act, RBOCs are prohibited from providing advanced services, including long-distance data offerings, without first opening up their local networks to competitors. Several RBOC-support "data relief" bills have been proposed in Congress that seek to weaken RBOC interconnection and unbundling requirements. Supporters of these bills argue that current policies are impeding the widespread availability of advanced services, and that granting data relief would accelerate the rollout of broadband services to the disenfranchised and give consumers and businesses a wider choice of services. Although such legislation has gained significant visibility, we believe chances for success are limited. However, as political winds are unpredictable, any attempts to revise interconnection and unbundling rules are worth monitoring because of their potentially significant impact on the ability of competitors to deploy their networks.

◆ Technology-Specific Regulation

In the sections that follow, we present brief summaries of regulatory issues that affect specific classes of broadband competitors. These are generally organized by technology. More comprehensive discussions of these regulatory issues are contained in the individual chapters pertaining to the various types of competitors.

Broadband Wireless Regulation: Any carrier with the appropriate wireless license may offer a full range of voice and data communications and is entitled to the same rights as other carriers under the 1996 Telecommunications Act, including interconnection, collocation, number portability, and access to unbundled network elements. To the extent that broadband wireless operators use their own wireless links to connect customers, they are unaffected by issues related to gaining access to incumbent loops and circuits. Further, broadband wireless carriers offering exclusively data/Internet services over their own facilities are entirely free from the need to establish interconnection agreements with the incumbent carrier.

Wireless providers' rooftop rights remain a point of controversy.

However, to deploy their equipment, broadband wireless operators must also obtain access to rights-of-way, buildings, and, in most cases, rooftops. Building owners are not subject to any law requiring them to allow wireless providers access to their rooftops. This has led to several disputes between commercial building owners and wireless operators concerning licensing, antenna siting, and rights of way. Although the FCC has ruled in favor of non-discriminatory access to buildings in order to promote competition, commercial building owners have asserted their rights as private property owners and resisted legal attempts to force access to their facilities. The FCC is currently conducting proceedings on competitive access to buildings. In practice, wireless operators usually gain rooftop and building access through direct, private negotiations with building owners.

Each of the four licensed wireless bands that has seen commercial deployment (MMDS, 24 GHz, LMDS, and 39 GHz) is subject to its own licensing rules. In general, each of the four bands has been authorized for provision of any voice, data, or video service. The amount and characteristics of spectrum licensed for each band vary significantly. These distinctions are discussed at length in Section 6. The primary unlicensed bands used to provide broadband services are the 2.4 GHz band and the 5 GHz band. These frequencies are unregulated and accessible by any carrier wishing to provide service. Commercial operators at these frequencies are not entitled to exclusive use, and the FCC has provided little formal guidance concerning the resolution of interference among multiple carriers.

Cable-ISP exclusivity will likely remain through each operator's franchise expiration.

Cable and Cable Internet Regulation: Cable television systems are subject to state and local regulation through the franchising process. Local officials usually provide significant input on decisions concerning franchise selection, service rates, billing practices, and community-related programming and services. Cable television systems generally are operated pursuant to non-exclusive franchises that are granted for fixed terms and terminable if the operator fails to comply with agreed-upon provisions. Franchises usually call for the payment of fees, often based on a percentage (typically under 5%) of the operator's revenues, to the granting authority.

Although the role of regulation in the cable industry has traditionally focused on deregulating basic service rates, the key regulatory issues pertaining to cable-based Internet service center around "open access" and the nature of today's often exclusive arrangements between cable ISPs and cable operators. At issue is the ability of competitive Internet service providers to offer services using the same cable plant as the primary cable ISP. Some local authorities have attempted to condition the transfer of cable franchises on the provision of third-party access. This issue has been examined by the FCC, which has discouraged mandatory cable unbundling due to the legal and technical complexities of implementation and the associated delays in fostering its desired "inter-modal" (e.g., cable vs. DSL vs. MMDS) competition in the local residential market. Thus, as a practical matter, we believe the exclusive arrangements that currently exist between cable ISPs and cable operators will likely continue through each operator's franchise expiration.

Digital Subscriber Line Regulation: Regulations that affect DSL fall into two categories, depending on whether the incumbent or a competitor provides the service.

1. **Incumbent DSL Regulation:** The FCC considers DSL services provided by the ILEC to be special access services. As such, they receive less restrictive regulatory oversight than other ILEC services. In particular, ILECs are not required to file DSL tariffs at the state level, which provides them far greater pricing flexibility than for voice services, where the requirement to obtain approval to alter tariffs has hampered their ability to respond to competitive pressures.

2. **Competitive DSL Regulation:** The principal regulatory concerns of competitive DSL providers pertain to access to unbundled network elements, access to collocation space, and two related areas—line sharing and remote port access. Each of these areas corresponds to language in the 1996 Telecommunications Act that requires each telecommunications carrier to interconnect with other carriers and prohibits the installation of network features that would inhibit interconnection.

FCC rulings in 1999 significantly clarified definitions and terms for UNEs.

Unbundled Network Elements: Access to unbundled network elements allows DSL providers to purchase local loops at rates roughly equal to the cost of operating those loops. Following the FCC's UNE decision in September 1999, much of the uncertainty surrounding the terms and conditions for ILEC delivery of DSL-capable copper loops was removed.

The most contentious UNE-related issue pertaining to DSL are regulations concerning access to remote ports. This refers to nodes in the ILEC network that terminate approximately 30% of copper loops. At issue is competitive access to these ports, which is necessary in order for non-ILECs to provide meaningful broadband throughput to subscribers that are served off these ports. Remote ports are typically space-constrained and lack the types of environmental, network, and security controls found in ILEC central offices.

Collocation: Traditionally, CLECs have been required to construct a caged area within the CO for their equipment. DSL-based CLECs, especially those serving less dense markets and whose equipment requires relatively little space, have benefited from the FCC's requirement that ILECs offer "cageless" collocation, which reduces collocation expenses.

Line Sharing: In November 1999, the FCC mandated "line sharing" as a separate UNE. Under this ruling, competitors may provide high-speed data services over existing ILEC-operated voice lines by using only the high-frequency portion of those lines. This approach is compatible with asymmetric variants of DSL that provider faster downstream than upstream speeds. Line sharing, once implemented in scale, is expected to benefit competitive DSL providers, particularly those serving residential markets, through significant reductions in monthly loop costs as well as provisioning time and expense. ILECs must make line sharing widely available in their regions by June 2000.

Section 4:
Fiber-Based Competitors

Fiber optic capacity was first deployed for long distance voice traffic in the late 1970s. These initial deployments carried DS-3 traffic (45 Mbps) for about 15-20 miles before requiring repeaters to regenerate the signal. Fiber was typically restricted to long-haul applications and backhaul transport until local builds emerged in the mid 1980s. Today, fiber-optic links can support throughputs as high as 1 terabit/sec for distances spanning several thousand miles without the need for electrical signal regeneration.

◆ Brief History—CAPs, the Early Fiber Competitors

CAPs opened the door for pre-Telecom Act competition.

Until 1988, only one carrier, the incumbent, provided local service to virtually every home and business in a given market. The first wave of local competition began with the emergence of Teleport Communications Group (TCG), a start-up that built fiber-optic lines to connect large businesses in Manhattan directly to their long distance providers, thereby bypassing the incumbent local loop. Additional firms with similar strategies soon emerged, such as Metropolitan Fiber Systems (MFS), ICG Communications, Inc. (Nasdaq: ICGX; Not Rated), and Intermedia Communications Inc. (Nasdaq: ICIX; Not Rated). These firms collectively became known as competitive access providers (CAPs). The CAPs fought many permitting and other regulatory battles that have since paved the way for today's competitive environment. Included among their early achievements were state approvals to provide competitive services, municipal approvals to dig up city streets for fiber deployment, and the acceptance of their services among end users and long-distance carriers.

The CAPs had to earn every mile of fiber they deployed. By 1995, CAPs had expended some $3.8 billion in capital and laid 15,000 miles of fiber connecting 14,000 buildings—all of this prior to the enactment of the 1996 Telecommunications Act. While this effort yielded the new competitors a relatively small portion of the overall business market, the incumbents' response to their activities was dramatic. ILEC deployment of fiber nearly doubled and the effective price of access, both in terms of T1 lease rates and the access fees paid by long-distance carriers to terminate local traffic, was halved.

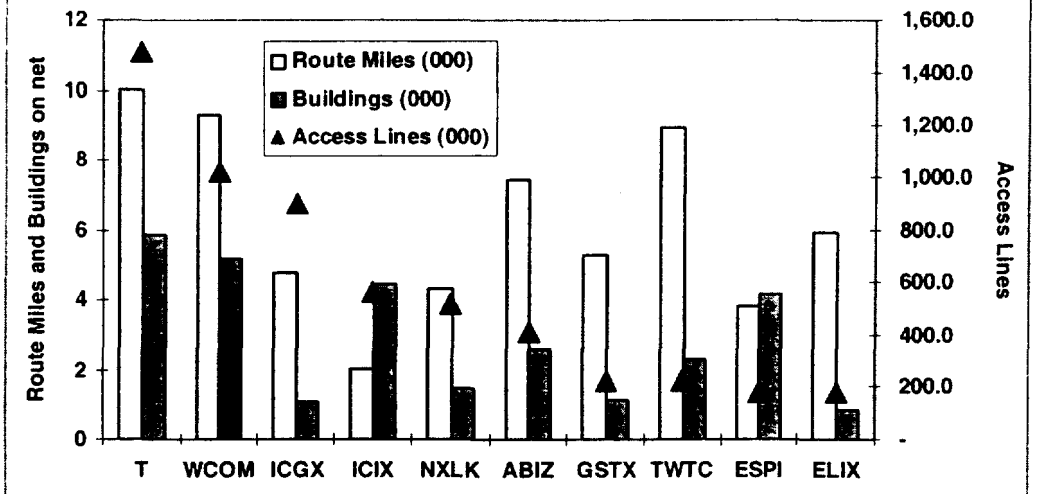
◆ From CAPs to Fiber-Based CLECs

Evolution toward broader services.

As competition increased, CAPs shifted their business focus from providing special access to offering a broader set of services. In so doing, many CAPs installed extensive switching facilities, acquired Internet service providers (ISPs), and merged with long distance carriers. Early examples of telecom-Internet convergence include the following mergers: MFS-UUNet, followed by WorldCom-MFS; AT&T-Teleport; Intermedia-Digex; and ICG-Netcom. As their service offerings changed, these competitors became known as CLECs (competitive local exchange carriers) to reflect their local switching capacity, while carriers with long-haul and Internet assets were also labeled ICP (integrated communications provider).

Competitive providers, now operating in more than 200 local markets, collectively earned local revenues of more than $13 billion in 1999. Over the last ten years, competitors laid some 190,000 route-miles of fiber and installed more than 2,400 voice and data switches. As with the early CAPs, each mile deployed was hard won due to the time-consuming and expensive process of obtaining permits, digging up city streets, and connecting buildings. As a rough guide, it costs approximately $100,000-$250,000 per mile to deploy fiber in a metropolitan area.

Exhibit 4-1 ◆ Leading Fiber-Based CLEC Operations



Notes: AT&T data includes the former Teleport Communications Group. Worldcom data includes the former MFS Communications and Brooks Fiber Properties. Definition of access line differs by company.

Source: Company data and Dain Rauscher Wessels

While fiber constitutes these carriers' core access medium, many of these companies also used leased facilities, broadband wireless, and other approaches to reach customers.

◆ Regional and Long-Haul Fiber Competitors

Until the mid-1990s, long-distance traffic was carried almost exclusively over the networks of the leading national carriers, AT&T, MCI WorldCom, and Sprint. During the last five years, however, several new long-haul carriers have deployed their own regional or national fiber networks. Often, these networks were constructed along railroad, energy pipeline, or utility rights of way, with active financial backing from entities in these other industries. The emergence of these new carriers was supported by a rapidly growing long-haul services market fueled by increased long distance voice usage, and, more significantly, dramatic growth in Internet traffic.

Among the competitors that have built new long-haul networks (or acquired companies that built new networks) on a national scale are Williams Communications, Qwest, Level 3, Enron Broadband Services, Global Crossing, and Broadwing. Regional fiber competitors include Metromedia Fiber Network, NorthEast Optic Network, CapRock Communications, Touch America, and a host of energy and utility-affiliated companies that are likewise constructing their own networks. Two recent entrants to the long-haul market are Aerie Networks, which is affiliated with several energy pipeline companies, and America's Fiber Network, a consortium of six electric utilities and communications firms.

Many long-haul carriers offer a mix of retail services, which are provided directly to end-users, and wholesale or carrier services, which are provided to other carriers. Although most long-haul carriers provide services over their own facilities, many use the facilities of their competitors for redundancy purposes or to provide interim service in markets that are under construction. In addition, many of these firms lease portions of their fiber networks to other carriers. Pricing is generally based on the amount of capacity provided, minutes of use, distance of communication, or other factors.

Section 4: Fiber-Based Competition

Exhibit 4-2 ◆ Regional and Long-Haul Fiber Construction

Carrier	Domestic route miles constructed	Position
Williams Communications Group	26,000	National inter-city network connecting 79 metro areas; 33,000 route miles planned connecting 125 metro areas.
Global Crossing	19,000	National [illegible] areas; 2,000 [illegible]
Qwest	18,815	Long-haul and major metro area network connecting 136 metro areas.
Broadwing	16,888	National [illegible] metro areas
Enron Broadband Services	14,400	National inter-city network connecting 52 major metro areas.
TouchAmerica	12,000	Inter-[illegible] [illegible] planned
Level 3 Communications	11,800	Long-haul and major metro area network connecting 30 metro areas; 16,000 route miles planned connecting 150 metro areas.
CapRock Communications	3,700	Six-state build [illegible] cities; 7,100 [illegible]
Metromedia Fiber Network	1,455	Metro area networks in 17 cities; 3,500 route miles planned.
NorthEast Optic Network	1,000	Eleven-state build [illegible] Maine and Virginia; 2,000 [illegible]

Source: Company reports and Dain Rauscher Wessels

Apart from pure fiber-based delivery services, many long-haul and regional carriers leverage their networks to offer additional services on a wholesale or retail basis, such as collocation, server hosting, and local access services.

Lit Vs. Dark Fiber

When choosing to add fiber assets to its network, a carrier that does not wish to construct its own facilities can typically acquire lit or dark fiber.

Lit Fiber: Lit fiber refers to leased capacity (usually measured in bandwidth units such as T1, DS-3, OC-3, and so forth) between two points for a fixed period, typically one to five years. This is a relatively short-term, speed-to-market option for a carrier that does not wish to enter into the complexities of customizing its own long-haul capacity. Lit fiber is often offered in conjunction with service-level guarantees that provide for credits in the case of unforeseen outages.

Lit fiber leases are usually priced according to bandwidth and distance, but fixed-charge and hybrid arrangements are not unusual. The long-distance portion of a T1 circuit can run on the order of $1.50-$2.50 per DS0-mile per month, depending on volume commitments and contract length. Coast-to-coast T1 capacity usually costs between $4,500-$6,000 per month, whereas a regional segment, such as Cleveland-Pittsburgh or Philadelphia-New York would be priced on the order of $700 per month, not including local access charges.

Dark Fiber: The alternative to obtaining lit fiber it is to lease or buy dark fiber, which appears as an asset on the acquiring carrier's balance sheet and refers to one or more strands of fiber, or even wavelengths on a particular strand. It is then the carriers' responsibility to convert this asset into bandwidth by placing optical electronics (optronics) at the end points of the fiber. Dark fiber is usually obtained by entering into a long-term (typically 10-20 years) indefeasible right of use, or IRU. This arrangement provides the purchaser with absolute control over that strand, including the ability to deploy its own optronic equipment and scale to meet its capacity needs within the time frame of the IRU.

Dark fiber IRUs are typically priced per fiber strand by distance. Monthly rates of $1,200-$1,800 per fiber mile are typical of today's pricing, with significant variations depending on carrier, market (urban vs. rural), and contract duration. Often, a carrier deploying new conduit (which can accommodate 72, 96, or even more strands) will lease out several strands to other carriers to help pay for the fiber build.

Exhibit 4-3 ◆ Recent Fiber Transactions

	Seller	Buyer	Price (mil.)	Comment
May-00	SBC Communications	Metromedia Fiber Network	$432.0	20-year agreement
May-00	Touch America	Williams Communications Group	$80.0	
May-00	Teligent Inc.	Level 3 Communications	NA	
May-00	ITC DeltaCom, Inc.	Metromedia Fiber Network	NA	20-year agreement
Apr-00	Viatel	Level 3 Communications	$150.0	
Mar-00	Shaw Communications	360 Networks	$170.0	
Mar-00	Lightship Telecom	NorthEast Optic Network	NA	5-year agreement
Mar-00	Yipes	Metromedia Fiber Network	$125.0	20-year agreement
Mar-00	KPNQwest	360 Networks	NA	
Mar-00	PSINET	360 Networks	$120.0	10-year agreement
Feb-00	Cogent Communications	Metromedia Fiber Network	$100.0	20-year agreement
Jan-00	Logix Communications Corp.	CapRock Communications	NA	20-year agreement
Jan-00	360 Networks	GST Telecommunications	$30.0	
Jan-00	Adelphia Business Solutions	Allegheny Communications Connect	NA	
Jan-00	Adelphia Business Solutions	Level 3 Communications	NA	
Jan-00	Adelphia Business Solutions	Williams Communications Group	$23.0	25-year agreement
Jan-00	Adelphia Business Solutions	Metromedia Fiber Network	NA	
Jan-00	RNK Telecom	NorthEast Optic Network	$2.9	5-year agreement
Jan-00	Allegiance Telecom, Inc.	Metromedia Fiber Network	$130.0	20-year agreement
Jan-00	Allegiance Telecom, Inc.	Level 3 Communications	$20.0	
Dec-99	FiberNet Telecom Group	Metromedia Fiber Network	5 million shares	20-year agreement
Dec-99	Winstar Communications	Williams Communications Group	$640.0	7-year agreement
Dec-99	360 Networks	Williams Communications Group	$26.5	20-year agreement
Dec-99	RCN Communications	NorthEast Optic Network	NA	20-year agreement
Oct-99	Bell Atlantic	Metromedia Fiber Network	$550.0	5-year agreement
Oct-99	Adelphia Business Solutions	CapRock Communications	$7.2	30-year agreement
Oct-99	Storage Networks, Inc.	Metromedia Fiber Network	$96.0	20-year agreement
Oct-99	Winstar Communications	Metromedia Fiber Network	$300.0	20-year agreement
Aug-99	ZipLink	NorthEast Optic Network	NA	
Jul-99	MCI Worldcom	NorthEast Optic Network	NA	3-year agreement
Jul-99	Winstar Communications	Metromedia Fiber Network	$40.0	25-year agreement
Jul-99	Williams Communications Group	CapRock Communications	$18.0	
Jul-99	Frontier Communications	NorthEast Optic Network	NA	3-year agreement
Jul-99	Vitts Networks	NorthEast Optic Network	$3.0	5-year agreement
Jun-99	Williams Communications Group	GST Telecommunications	$62.5	
Jun-99	Focal Communications	Metromedia Fiber Network	$57.0	20-year agreement

Source: Company reports and Dain Rauscher Wessels

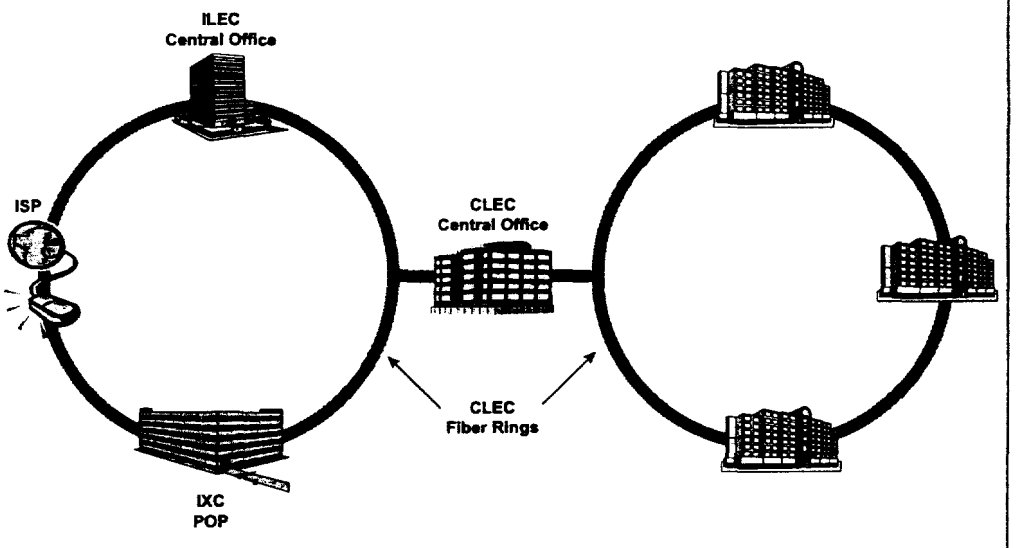
Role of the Utilities: As mentioned earlier, much of today's fiber capacity was constructed along the rights of way and with the financial support of gas and power utilities, many of which have used the free cash flow coming from their core operations to fund fiber deployment. With significant rights of way as well as existing customer relationships, many of these firms have found the addition of telecom capacity to be so attractive that they formed their own telecommunications subsidiaries. In many cases, telecom competitors continue to partner with utilities to jointly build fiber networks, and in other cases, the utilities have set up their own commercial telecom subsidiaries. Notable examples include Enron Broadband Services, Williams Communications, and Montana Power's Touch America subsidiary. In addition, two recent consortia have been formed to construct national or multi-regional fiber networks—America's Fiber Network, supported by a group of electric utilities, and Aerie Communications, supported by group of pipeline companies.

◆ Local Fiber Networks

Fiber is expensive to deploy but offers unparalleled performance.

Because of their high deployment costs, early local fiber networks targeted office buildings in dense downtown business districts. Today, compared to enhancing the copper plant (DSL) or cable plant, or deploying broadband wireless equipment, fiber remains the most capital-intensive way of installing local broadband capacity. Nevertheless, the capacity of fiber far exceeds the capabilities of other transmission media. New fiber deployment is still largely restricted to business markets whose bandwidth requirements are large enough to justify the cost.

Exhibit 4-4 ◆ Local Fiber Network Configuration



Source: Dain Rauscher Wessels

Central Office: Just like the ILECs, fiber-based competitors maintain a central office in each of their operational markets. The central office typically contains Internet and data routing equipment and, for voice services, a circuit switch to route traffic and provide enhanced calling features such as three-way calling, call waiting, and caller ID. The switching equipment also monitors the network and collects customer data. Newer types of telecommunications switches supply both local and long-distance traffic routing functions. As a rough guide, class 5 local switches cost $1-$3 million, depending on capacity and features.

Fiber Ring: The fiber ring is deployed throughout central business districts and from downtown locations to outlying office parks. Fiber networks are expensive to deploy not because fiber itself is expensive, but because city streets literally have to be dug up to lay the fiber. The networks are typically deployed using the synchronous optical network (SONET) standard, which facilitates interoperability with other networks and supports advanced data services such as frame relay and ATM. Fiber deployment costs can amount to $20 million for a medium-sized metropolitan area. Often, local fiber is purchased from wholesale providers.

Building Access: While CLEC fiber rings pass hundreds of thousands of buildings, actual connections to buildings are not made until paying customers are contracted. This last connection may only be several yards or a few blocks, but again the construction process itself is expensive. In addition, each building must be equipped with the appropriate electronics to turn the optical signals back into electrical signals for connection to customers' voice and data networks.

ILEC Interconnection: Competitors must establish interconnections with the incumbent network in order for their customers to communicate with ILEC customers, and vice versa. Despite interconnection provisions in the 1996 Telecommunications Act and efforts by state commissions to make the process more efficient, it can take several months for a competitor to establish interconnections in new markets.

Long Distance Access: Similar to the early CAP days, numerous CLEC customers purchase special access lines that connect them directly to long distance providers, thereby bypassing the incumbent network altogether. Similarly, long distance companies often purchase lines from CLECs to gain access to their large customers.

Dedicated Internet Access: With direct physical connections to customers, fiber-based CLECs have a significant competitive advantage in the provision of high-speed data links to Internet service providers. Fiber provides as much capacity as any ISP or Internet customer can handle.

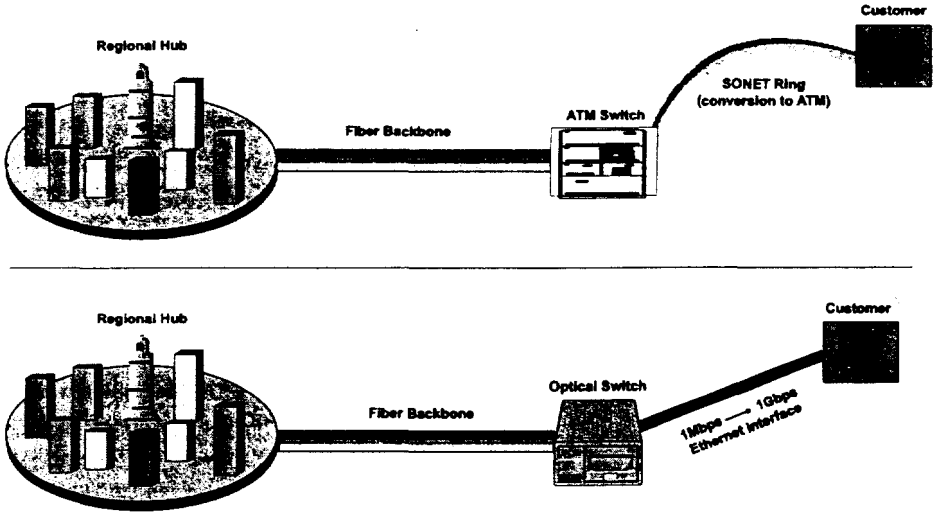
◆ Metropolitan Optical Access Carriers

Historically, local area network (LAN) speeds inside a corporate office have exceeded metropolitan and wide-area networking speeds. However, the extensive build-out of long-haul fiber networks has significantly increased the bandwidth available for wide-area networks. Despite this abundance of long-haul bandwidth, carriers have been limited in their ability to provision incremental capacity or manage bandwidth in the metropolitan area. In recent months, many technology developers have promoted products intended to increase both raw bandwidth in the metropolitan network as well as improve the ability of carriers to manage bandwidth.

Optical access carriers offer the potential for more affordable and dynamically configurable bandwidth.

Leveraging some technological advances in optical switching and transport, a new category of carrier, the *metro optical access carrier* (OAC) has emerged that seeks address the metropolitan bottleneck by providing high-speed optical connectivity not just over long-haul and regional links, but all the way to the local area network and even desktop. This model, also referred to as "IP over glass," seeks to take advantage of fiber optic links that already extend to enterprises, multi-tenant office buildings, and (with the recent fiber deployments by building-centric service providers) many small businesses, while eliminating the conversion of traffic from the optical layer to the electrical layer. By using Ethernet as the transport protocol all the way to the end user, instead of using ATM switches in the metro area and then converting back to Ethernet once it reaches the customer, carriers have the potential to realize significant network efficiencies and flexibility advantages for their customers.

Exhibit 4-5 ◆ Conventional SONET/ATM Architecture vs. Optical Access Architecture



Source: Dain Rauscher Wessels

Commercialization of OAC services hinges on the introduction of next-generation routers that combine several advantages, including:

1. the ability to carry traffic at terabit speeds through advances in dense wave division multiplexing (DWDM);
2. the ability to switch IP traffic at terabit speeds; and
3. the ability to switch optical wavelengths without converting them to electronic signals.

Service Offerings: OAC services are still largely in the initial rollout stages. Nevertheless, a number of pricing models are being explored by various carriers. On balance, carriers we have spoken with envision offerings on the order $1,000-$2,000 per month for 100 Mbps access. By comparison, a DS-3 installation from the ILEC could cost the customer on the order of $2,500 for set-up and $4,000 on a recurring monthly basis.

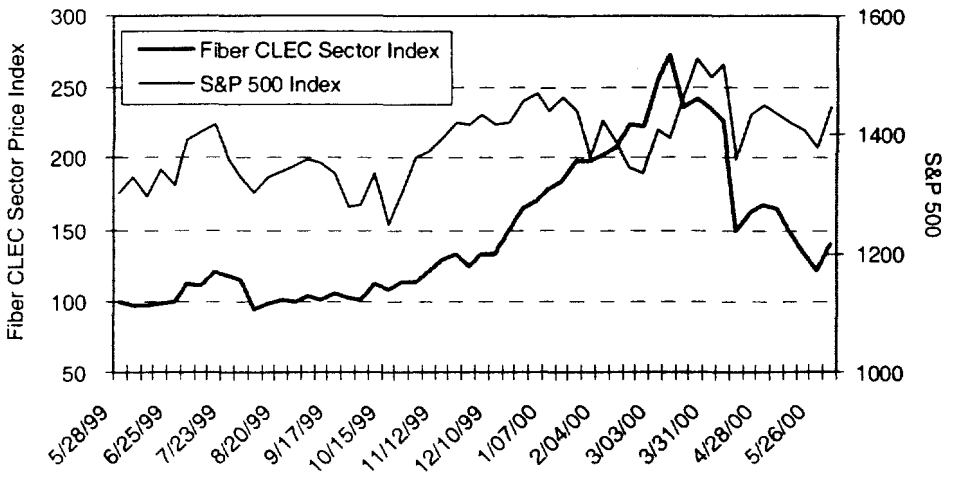
Advantages: Once fully implemented, these services should allow for greater control over bandwidth by offering services that can be tailored to fit customers' needs. For instance, businesses that wish to expand beyond the capacity of T1 connections can purchase incremental bandwidth in 1 Mbps increments as needed, rather than step up to a full DS-3. More important for some customers, the provisioning cycle for these new OAC services could well take a fraction of the time (hours or days) than is currently the norm with leased capacity (often weeks or even months). Further potential advantages include the ability to pay for each connection according to usage (by the day or even hour), the ability to flexibly route corporate connections among different locations or even outside parties, and a general level of network control that far surpasses existing offerings.

Disadvantages: Even though optical access carriers forego the relative switching inefficiencies of converting from optical waves to ATM/SONET, they face number of additional challenges with respect to quality and availability of service. In many cases, optical access offerings may lack the quality of service features of ATM (such as 99.999% availability) and the redundancy and restoration mechanisms inherent in SONET ring architectures. Thus, early optical access services may be most appropriate for corporate Internet access rather than mission-critical internal applications. By using mesh networks, which differ from SONET rings in that they create multiple paths through a network by establishing point-to-point connections among all nodes, these carriers hope to emulate the reliability of the current network.

One of the issues surrounding optical access services is whether to enhance the current SONET and ATM infrastructures to support the next generation of high-speed, data services, or to replace them. SONET's key benefit is its reliability, but it is optimized for circuit switching and is less dynamic than Ethernet or WDM in terms of service provisioning. ATM is an efficient, reliable technology with strong quality-of-service attributes, and although competing technologies are certainly expected to make inroads, the ability of "data-optimized" SONET/ATM architectures to mesh with alternative approaches could well extend their longevity.

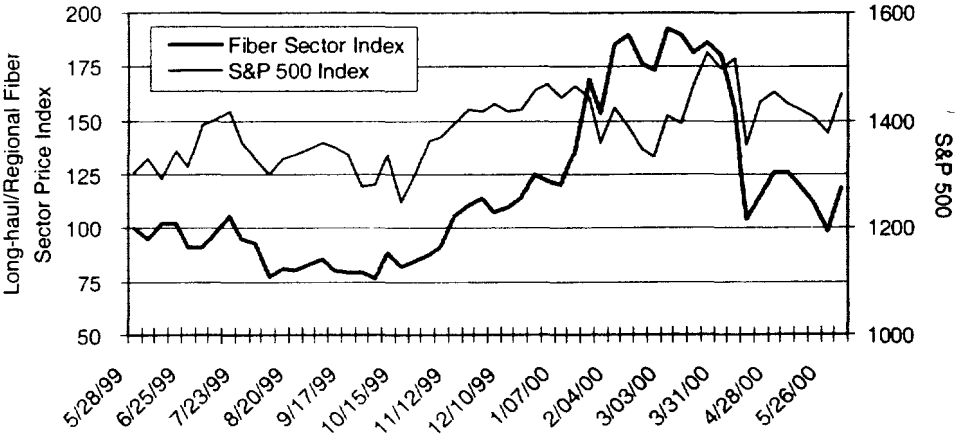
Incumbents also getting in the optical access game: Bell Atlantic recently announced a partnership with two optical networking firms to roll out a transparent wavelength service for high-speed applications (up to 1.25 Gbps). In addition, SBC Communications has announced plans to offer a fiber-based, point-to-point Ethernet interconnection service that links local area networks (LANs) within a single metropolitan area at transmission rates of 1 Gbps. Once these services are fully deployed, Bell Atlantic and SBC will likely be among the first RBOCs to provide corporate customers with dedicated, point-to-point gigabit Ethernet links.

Exhibit 4-6 ◆ Fiber CLEC Sector Price Index vs. S&P 500



Source: FactSet

Exhibit 4-7 ◆ Long-Haul/Regional Fiber Sector Price Index vs. S&P 500



Source: FactSet

Exhibit 4-8 ◆ Publicly Traded Fiber-Based Local Competitors

(Amounts in millions, except per share figures)

			Stock Price Information					Balance Sheet					Revenue			Enterprise Value / Rev.	
Company	Symbol	FYE	Price 06/01/00	52 Week Range High	Low	Shares Out.	FD Shares Out.	Market Cap.	Long Term Debt	Preferred Stock	Cash	Enterprise Value	CY 99	CY 00	CY 01	CY 00	CY 01
Adelphia Business Solutions, Inc.	ABIZ	Dec	$27.25	$70.44	$14.75	34.22	69.44	$1,892	$845	$261	$2	$2,996	$155	$411	$953	7.3 x	3.1 x
Electric Lightwave, Inc.	ELIX	Dec	17.50	27.00	10.50	9.26	50.13	877	625	0	21	1,481	187	273	446	5.4 x	3.3 x
e.spire Communications, Inc.	ESPI	Dec	3.69	16.19	3.00	51.12	52.20	192	796	282	81	1,189	247	349	450	3.4 x	2.6 x
ICG Communications	ICGX	Dec	19.88	39.25	13.94	48.60	48.60	966	2,129	534	41	3,587	476	829	1,180	4.3 x	3.0 x
Intermedia Communications, Inc.	ICIX	Dec	28.88	77.38	18.13	51.83	53.30	1,539	2,935	917	251	5,140	906	1,193	1,541	4.3 x	3.3 x
Time Warner Telecom, Inc.	TWTC	Dec	60.13	93.00	19.88	33.00	105.22	6,326	404	0	265	6,465	269	424	582	15.3 x	11.1 x

Source: FactSet

Exhibit 4-9 ◆ Publicly Traded Long-Haul/Regional Fiber Competitors

(Amounts in millions, except per share figures)

			Stock Price Information										Revenue			Enterprise Value / Rev.	
Company	Symbol	FYE	Price 06/01/00	52 Week Range High	Low	FD Shares Out.	Market Cap.	Long Term Debt	Preferred Stock	Cash	Enterprise Value	CY 99	CY 00	CY 01	CY 00	CY 01
Broadwing, Inc.	BRW	Dec	$25.19	$41.06	$16.31	213.51	$5,378	$2,136	$358	$80	$7,792	$1,699	$2,095	$2,607	3.7 x	3.0 x
CapRock Communications Corp.	CPRK	Dec	21.38	58.50	17.25	33.29	712	348	0	188	871	193	287	384	3.0 x	2.3 x
Global Crossing Ltd.	GBLX	Dec	25.69	61.81	20.25	817.65	21,003	5,019	2,085	1,727	26,380	1,665	4,800	NA	5.5 x	NM
Level 3 Communications, Inc.	LVLT	Dec	79.50	132.25	45.25	365.71	29,074	3,989	0	3,492	29,571	515	1,102	2,002	26.8 x	14.8 x
Metromedia Fiber Networks	MFNX	Dec	35.19	51.88	10.56	544.23	19,150	2,673	0	2,535	19,289	75	160	331	120.3 x	58.2 x
NorthEast Optic Network, Inc.	NOPT	Dec	34.75	159.00	14.00	16.66	579	180	0	94	665	6	17	57	39.1 x	11.8 x
Qwest Communications International, Inc.	Q	Dec	43.00	66.00	25.75	754.50	32,444	2,368	0	349	34,463	3,928	5,090	6,490	6.8 x	5.3 x
Williams Communications Group, Inc.	WCG	Dec	38.44	61.81	23.25	463.60	17,820	2,971	0	1,914	18,876	2,023	2,495	3,850	7.6 x	4.9 x

Source: FactSet

Section 4: Fiber-Based Companies

Company	Website	Description	Headquarters	Investors	Ticker
Broadwing	www.broadwing.com	Broadwing is the merger between ILEC Cincinatti Bell and long-haul provider IXC Communications. The combined carrier provides local, long distance, and wireless voice services as well as a 16,888-mile inter-city fiber backbone, hosting, collocation, and e-commerce services.	5000 Plaza on the Lake Austin, TX 79746		BRW
CapRock Communications	www.caprock.com	CapRock owns and operates a six-state fiber backbone that, once completed, will span 7,500 miles connecting tier 1, 2, and 3 markets in TX, AZ, NM, OK, LA, and AR over a packet-switched IP/ATM platform. CapRock generates revenues primarily from wholesale services to more than 160 carrier customers, as well as integrated local, long distance, and data services to several thousand business customers. The company's provides local services using a base of more than 50 collocations (200 planned by year-end) coupled with a smart-build strategy employing leased circuits, UNEs, UNE-P, and DSL.	15601 Dallas Parkway Dallas, TX 75001		CPRK
ICG Communications	www.icgcomm.com	ICG Communications provides integrated voice and data services to businesses in more than 700 cities. In addition, the company provides services to ISPs and long-haul carriers over its intercity network.	161 Inverness Drive West Englewood, CO 80112	Liberty Media Group; Hicks, Muse, Tate & Furst; Gleacher Capital Partners	ICGX
Intermedia Communications	www.intermedia.com	Intermedia Communications is an integrated broadband provider of voice, data networking (DSL, frame relay, ATM), and Internet-related offerings. The company also delivers broadband services to multi-tenant buildings and holds a majority stake in Digex, a provider of high-end managed hosting services.	3625 Queen Palm Drive Tampa, FL 33619	Kolhberg Kravis Roberts, Microsoft, Compaq	ICIX
ITC^DeltaCom	www.itcdelta.com	ITC^DeltaCom is a full-service broadband provider serving business customers in 10 Southeastern states. The company operates an 8,320-mile fiber optic network and switching infrastructure over which it provides long-distance, local, data networking, and Internet access, hosting, and collocation services. The company's offerings also include managed modem services for ISPs, network services for other carriers, and network management services for business customers.	1791 O.G. Skinner Drive West Point, GA 31833	SCANA Corp.	ITCD
Metromedia Fiber Networks	www.mmfn.com	Metromedia Fiber Network provides fiber capacity and Internet infrastructure services. Together with its subsidiaries, AboveNet Communications and PAIX.net, the company provides collocation and Internet connectivity services along with its wholesale bandwidth services.	One North Lexington Avenue White Plains, NY 10607		MFNX
NEXTLINK Communications	www.nextlink.net	NEXTLINK Communications provides end-to-end broadband services to businesses in over 50 U.S. markets via its fiber optic, wireless, and DSL facilities. Through its acquisition of Concentric Network, NEXTLINK is now a leading provider of Internet and Web hosting services. The company recently announced acquisition of multiple European metropolitan fiber networks, an inter-city pan-European fiber network, and transatlantic fiber-optic capacity.	1505 Farm Credit Drive McLean, VA 22102	Eagle River Investments LLC.(Craig McCaw), Ampersand Telecom, Forstmann Little, Level 3	NXLK

		Description	Address	Financial Sponsor	Ticker
NorthEast Optic Network	www.neoninc.com	NorthEast Optic Network owns and operates a fiber optic network in the Northeastern United States. The company provides transmission capacity to other service providers over its 1,000+ route miles.	391 Totten Pond Road Waltham, MA 02154	CMP Group, Inc., Gilder Gagnon Howe & Co., Northeast Utilities and several other regional utilities	NOPT
Time Warner Telecom	www.twtelecom.com	Time Warner Telecom is a fiber facilities-based integrated communications provider in selected metropolitan markets across the U.S. The company offers local businesses "last mile" broadband connections for data, high-speed Internet access, local voice, and long distance services, with future Internet-related product	10475 Park Meadows Drive Littleton, CO 80124	Time Warner, Media One Group, Newhouse Capital	TWTC
Williams Communications Group	www.williamscommunications.com	Williams Communications operates a nationwide fiber-optic network focused on providing voice, data, Internet and video services to communications service providers. The company also sells, installs, and maintains communications equipment and network services to business customers.	One Williams Center Tulsa, OK 74172	The Williams Companies	WCG
AERIE Networks	www.aerienetworks.com	Aerie Networks is building a high-capacity inter-city network in the U.S. encompassing more than 20,000 miles connecdting approximately 200 cities. The majority the company's network will be built along 14,958 miles of rights of way of 12 natural gas, oil and liquid petroleum pipeline companies and communications companies.	1400 Glenarm Place Denver, CO 80202	VantagePoint Venture Partners	private
America's Fiber Network	www.americasfibernetwork.com	America's Fiber Network is a super-regional fiber-optic joint venture of six energy and telecommunications companies. The company initially plans to offer 7,000 route miles of fiber connecting major markets in the eastern and central United States.	221 N. Front Street Columbus, OH 43215	AEP Communications, GPU Telcom, Allegheny Communications Connect, FirstEnergy Telecom, CFW Communications, R&B Communications.	private
BTI Telecom	www.btitele.com	BTI is a facilities-based broadband provider of voice and data communications services to primarily small and medium-sized business customers in the Southeast. The company's services include local, long distance, data, Internet, and enhanced services as well as wholesale switched, private-line, and calling-card services to other carriers. BTI's fiber network covers approximately 3,700 route miles of fiber optics along the East Coast as well as local fiber linking major cities in North Carolina.	4300 Six Forks Road Raleigh, NC 27609	Welsh, Carson, Anderson & Stowe	private
Cogent Communicationws	www.cogentco.com	Cogent provides dedicated, high-bandwidth Internet services to businesses in multi-tenant commercial buildings as well as carrier customers over a metro-area, all-optical network. The company plans to deploy its services initially in 13 major cities. Strategic partners include Chromatis Networks, Cisco, Williams, and Metromedia Fiber Network.	1015 31st Street NW Washington, DC 20007	Jerusalem Venture Partners, Worldview Technology Partners, Oak Investment Partners, Boulder Ventures, C.Blair Asset Management.	private
Enron Broadband Services	www.enron.net	Enron Broadband Services operates a nationwide fiber backbone to provide transport services as well as content delivery, bandwidth trading, and bandwidth intermediation services. The company's carrier customers include long-distance providers, incumbent local phone companies, wireless data network providers, and Internet service providers.	2100 SW River Parkway Portland, OR 97201	Subsidiary of Enron Corp.	private

Section 4: Fiber-Based Competitors

Broadband Services Companies	Internet	Description	Address	Financial & Strategic Partners	Private
KMC Telecom	www.kmctelecom.com	KMC Telecom provides facilities-based broadband services to business customers in 17 tier 2 and tier 3 markets in the Mid-Atlantic, Midwest and South. The company operates its own fiber-optic and switching facilities in each of its markets	1545 Route 206 Bedminster, NJ 07921	Nassau Capital Partners, Newcourt Capital, CoreStates Holdings, General Electric Capital, Lucent Technologies.	private
Millennium Optical Networks	www.mopticalnets.com	Millennium Optical Networks provides a managed network of high capacity OC-n services to carriers in the New York metropolitan area, with planned expansions to additional markets. The company's customers include Internet service providers and telecommunications carriers.	200 Madison Avenue New York, NY 10016		private
PF.Net	www.pf.net	PF.Net is a facilities-based provider of fiber-optic communications infrastructure to communications carriers, Internet service providers corporations with enterprise network needs and government entities. PF.Net's planned fiber-optic network of duct and fiber will extend beyond 10,800 miles and is scheduled to be completed in 2001.	1625 B Street Washougal, WA 98671	Odyssey Investment Partners, Koch Telcom Ventures, Inc.	private
Phonoscope Communications	www.phonoscope.com	Phonoscope Communications owns and operates a major fiber optic network in Houston. Its offerings include high-speed Ethernet connectivity, dark fiber leasing, data, voice, video conferencing, cable TV, and cable modem services.	6105 Westline Drive Houston, TX 77036		private
Telseon	www.cmetric.com	Telseon is a metropolitan optical access carrier that provides gigabit Ethernet services to enterprise and carrier customers. The company's services include a variety of network deployments for high-bandwidth point-to-point, multi-location, and multicasting applications. Telseon plans to deploy its services in 20 metropolitan areas by year-end 2000. Strategic partners include 3Com, Cabletron, Cisco, Extreme Networks, Foundry Networks, AboveNet, Colo.com, Equinix, and Verio.	480 South California Avenue Palo Alto, CA 94306	Sevin Rosen Funds, Crosspoint Ventures, Morgan Stanley Dean Witter, The Goldman Sachs Group, Inc., Donaldson Lufkin, & Jenrette, Hunt Ventures, Level 3 Communications, NEXTLINK, and Enron.	private
Touch America	www.tamerica.com	Touch America, the telecommunications subsidiary of The Montana Power Company, is the owner, operator, and developer of a 12,000-mile fiber-optic network. Through its network and expanding alliances, the company offers high-speed access to the Internet, including a full-line of long distance services, as well as dedicated voice, data, video and frame relay solutions. In addition, Touch America offers last-mile services using its wireless spectrum assets.	40 East Broadway Butte, MT 59701	subsidiary of Montana Power Company	private
Yipes Communications	www.yipes.com	Yipes provides managed optical IP networking services, including Ethernet-based LAN-to-LAN and LAN-to-Internet connectivity for enterprise and carrier customers. The company's initial service deployments include seven major markets, with a planned national footprint by year-end 2000. Strategic partners include Micromuse, Extreme Networks, Juniper Networks, Level 3, Metromedia Fiber Networks, Lucent, and Akamai.	114 Sansome St. San Francisco, CA 94104	Sprout Group, Norwest Venture Partners, New Enterprise Associates, Soros Fund Management, Chase Capital Partners/H&Q, BancBoston Ventures/Robertson Stephens, NewSpeed Capital, Extreme Networks, Intel Capital, Juniper Networks	private

Section 5:
Digital Subscriber Line Services